



# MONTANA LEGISLATIVE BRANCH

## Legislative Fiscal Division

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**Director**  
AMY CARLSON

DATE: September 25, 2014

TO: Rep. Dudik and the Legislative Finance Committee

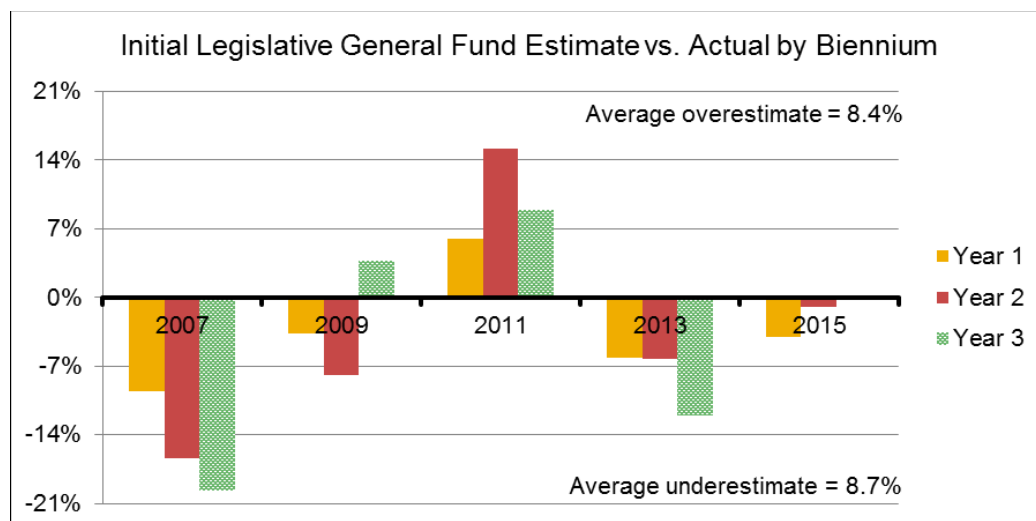
FROM: Stephanie Morrison, Revenue Analyst

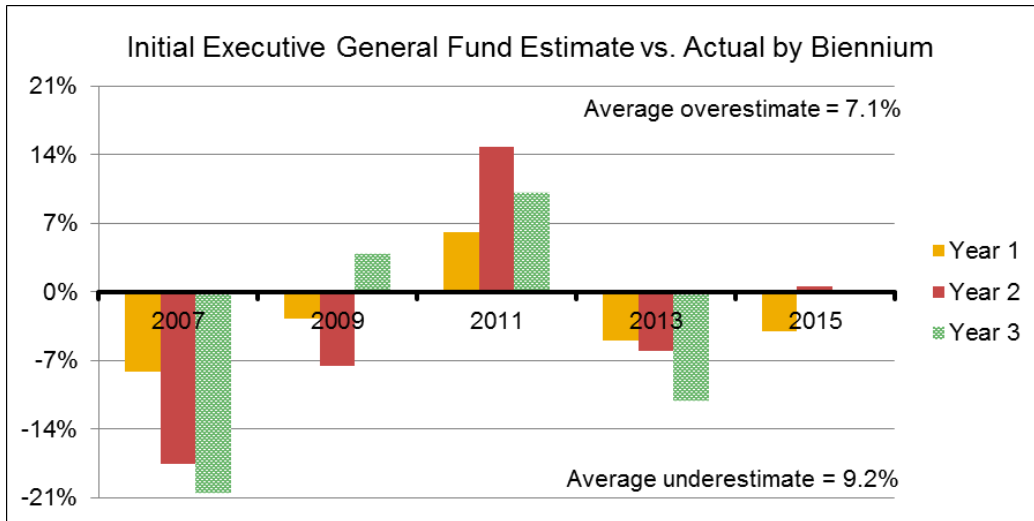
RE: Recent Years' Estimating Error

This memo is in response to a request made at the June 5<sup>th</sup> and 6<sup>th</sup> meeting of the Legislative Finance Committee (LFC) for an analysis of recent years' general fund revenue estimating error. The first part of the analysis is based on the initial legislative and executive estimates for the past five biennia. For the 2007 through 2013 biennia, these are the estimates that would have been presented to the Revenue & Transportation Interim Committee (RTIC) in advance of the legislative session. For the 2015 biennium, the estimates are those presented to the joint meetings of the House and Senate Tax Committees in January of the 2013 Session.

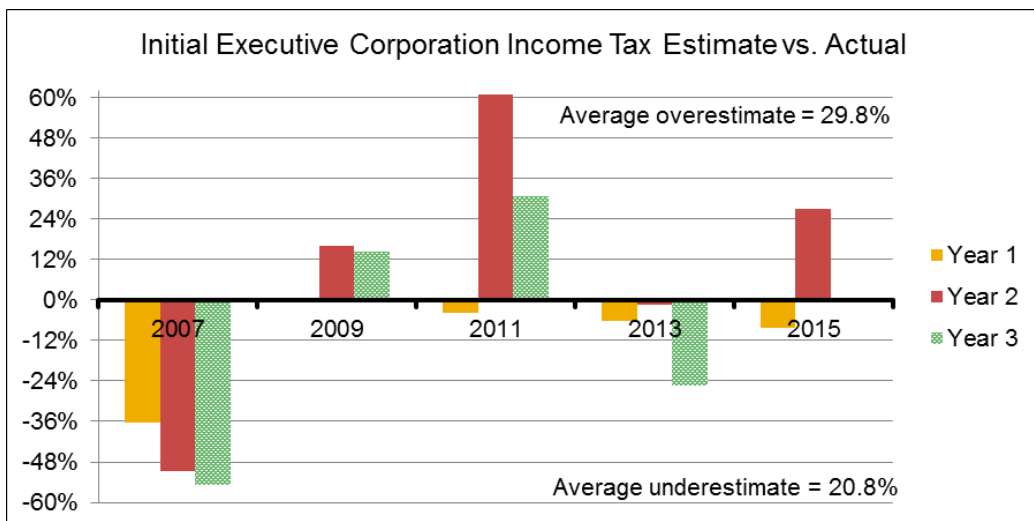
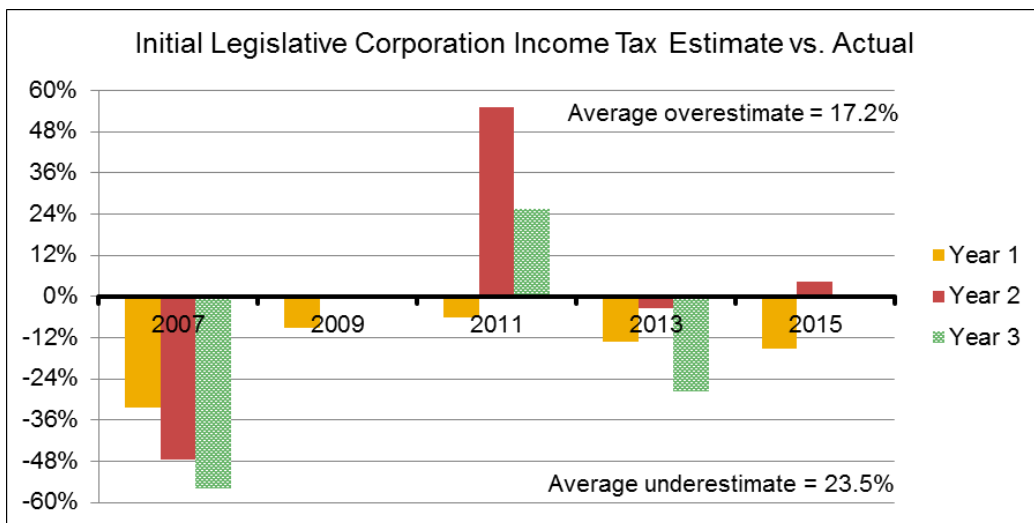
The charts below show the percentage error between the first, second and third year estimates of the biennial revenue compared to actual collections. For example, the revenue estimate for the 2007 biennium (FY 2005 through FY 2007) was presented to RTIC in November 2004. As illustrated in the first group of bars in the chart, that forecast significantly underestimated the growth of the subsequent biennium. The 2011 biennium estimate presented to RTIC in November 2008 overestimated the expected revenue, as shown by the third group of bars. The average of the over and underestimates is shown in each chart.

Note that the very small LFD underestimate and OBPP overestimate in FY 2014 has a dampening effect on the corresponding average values.





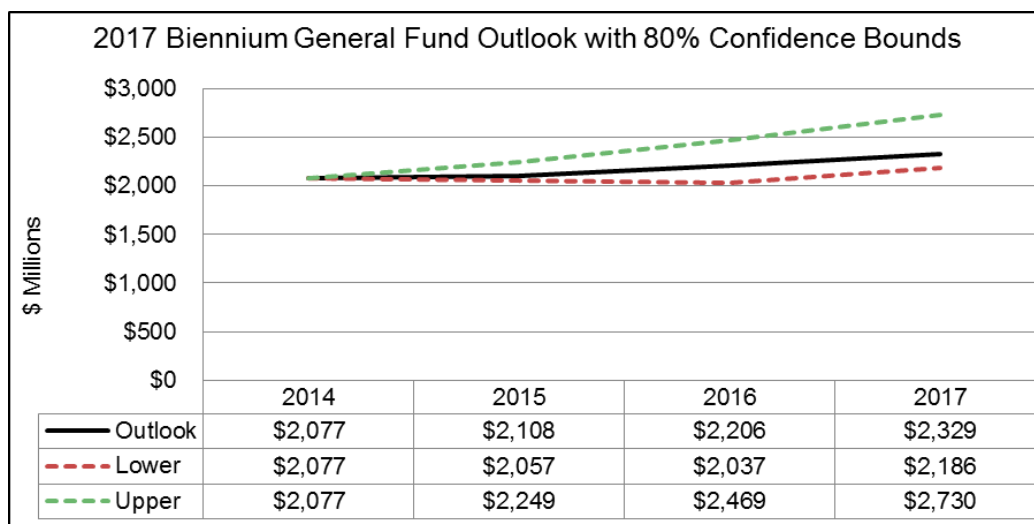
The corporation income tax estimate disproportionately contributes to the overall general fund estimate error due to the volatility of the income stream. The charts below are similar to the charts above, but show only the estimating error for corporation income tax.



### Confidence Bounds on the 2017 Biennium Outlook

Defining an error term as the percent difference between the actual and estimated collections, and assuming these terms follow a normal distribution, 80% confidence bounds were produced using general fund estimates dating back to the 1991 biennium and applied to the 2017 biennium outlook for revenue. The graph below illustrates the outlook revenue with these bounds.

The error terms for the confidence bounds analysis are based on post-session general fund estimates adjusted for legislation. Although using pre-session estimates would have been consistent with the rest of the analysis in this memo, post-session estimates adjusted for legislation were used due to the magnitude of legislative tax policy changes in earlier biennia.



### Using Statistical Techniques to Improve Forecast Accuracy

RTIC in particular and LFC in general have been interested in pursuing analysis of the source of underlying estimate error, with the objective improving forecast accuracy through minimizing future estimate error. As alluded to in the [2017 Outlook](#), LFD revenue analyst Sam Schaefer has undertaken a rigorous standard error analysis to better understand the source of estimate volatility—underlying econometric data forecasting error, modeling error, or intrinsic revenue unpredictability—and to direct data and model changes that would minimize the estimating error.

Preliminary results from this analysis are available for corporation income tax and treasury cash account (TCA) interest income. The corporation income tax analysis has enabled a more informed choice for underlying economic indicators that simultaneously fit historical collection patterns more closely and minimize the error bounds in forecast years. Mr. Schaefer will present his [recent paper](#) to LFC, and fill in the details of his analysis. The plan is for his work to be extended to the remaining top seven general fund revenue sources.